

**What is claimed is:**

1. A method of controlling roll stability of a vehicle comprising the steps of:

determining a roll angle of the vehicle; and

5 generating a tire moment in response to the roll angle so that a net moment on the vehicle is counter to a roll direction.

2. A method as recited in claim 1 wherein the tire moment approaches a gravity moment.

10 3. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a lateral acceleration.

4. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll  
15 angle in response to a lateral acceleration and yaw rate.

5. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a lateral acceleration, vehicle  
20 speed and yaw rate.

6. A method as recited in claim 1 wherein determining a roll angle comprises determining a lateral acceleration and a steering velocity.

7. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a roll rate.

5 8. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a vehicle speed.

9. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a yaw rate a pitch angle.

10 10. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a pitch rate.

11. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll  
15 angle in response to a pitch angle.

12. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a global positioning system signal.

20 13. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a steering angle.

14. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll  
25 angle in response to a steering velocity.

15. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a wheel speed.

16. A method as recited in claim 1 wherein  
5 determining a roll angle comprises determining a roll angle in response to a wheel normal load estimate.

17. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle.

10 18. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a roll acceleration.

19. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll  
15 angle in response to a longitudinal acceleration.

20. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a reference roll angle.

21. A method as recited in claim 1 wherein  
20 determining a roll angle comprises determining a roll angle in response to a relative roll angle.

22. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll

angle in response to a road bank angle and a previous roll angle estimate.

23. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle and a reference roll angle.

24. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a body roll angle initialization.

25. A method as recited in claim 24 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

26. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to an instantaneous roll angle reference.

27. A method as recited in claim 26 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

28. A method as recited in claim 1 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

29. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a roll angle estimate.

30. A method as recited in claim 29 wherein the  
5 roll angle estimate is determined in response to a reference roll angle and a body roll integration.

31. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll angle in response to a model roll angle.

10 32. A method as recited in claim 31 wherein the model roll angle is determined in response to a chassis roll observer.

33. A method as recited in claim 1 wherein  
15 determining a roll angle comprises determining a roll angle in response to a road bank angle time constant.

34. A method as recited in claim 33 wherein the road bank angle time constant is determined in response  
20 to a steering velocity, a lateral acceleration and a vehicle speed.

35. A method as recited in claim 1 wherein determining a roll angle comprises determining a roll  
25 angle in response to body slip.

36. A method of controlling roll stability of a vehicle comprising the steps of:

determining a roll angle estimate; and

generating a tire moment in response to a roll angle estimate, so that a net moment on the vehicle is counter to a roll direction.

5           37. A method as recited in claim 36 wherein the tire moment approaches a gravity moment.

38. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle  
10 estimate in response to a lateral acceleration.

39. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a lateral acceleration and yaw  
15 rate.

40. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a lateral acceleration, vehicle  
20 speed and yaw rate.

41. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a lateral acceleration and a steering velocity.  
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42. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a roll rate.

30           43. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a vehicle speed.

44. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a yaw rate a pitch angle.

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45. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a pitch rate.

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46. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a pitch angle.

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47. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a global positioning system signal.

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48. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a steering angle.

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49. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a steering velocity.

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50. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a wheel speed.

51. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a wheel normal load estimate.

5 52. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle.

53. A method as recited in claim 36 determining a  
10 roll angle estimate comprises determining a roll angle estimate in response to a roll acceleration.

54. A method as recited in claim 36 determining a roll angle estimate comprises determining a roll angle  
15 estimate in response to a longitudinal acceleration.

55. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a reference roll  
20 angle.

56. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a relative roll  
25 angle.

57. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle  
30 and a previous roll angle estimate.



58. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle and a reference roll angle.

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59. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a body roll angle initialization.

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60. A method as recited in claim 59 wherein the body roll angle initialization is determined in response to a lateral acceleration.

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61. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to an instantaneous roll angle reference.

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62. A method as recited in claim 61 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

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63. A method as recited in claim 36 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

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64. A method as recited in claim 36 wherein determining a roll angle comprises determining a roll angle in response to a model roll angle.

65. A method as recited in claim 64 wherein the model roll angle is determined in response to a chassis roll observer.

5        66. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle time constant.

10       67. A method as recited in claim 66 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

15       68. A method as recited in claim 36 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to body slip.

20       69. A method of controlling roll stability of a vehicle comprising the steps of:  
         determining a roll responsive control signal; and  
         generating a tire moment in response to the roll responsive control signal so that a net moment on the vehicle is counter to a roll direction.

25       70. A method as recited in claim 69 wherein the tire moment approaches a gravity moment.

30       71. A method as recited in claim 69 wherein determining a roll responsive signal comprises determining a roll responsive control signal in response to a lateral acceleration.

72. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
5 response to a lateral acceleration and yaw rate.

73. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
10 response to a lateral acceleration, vehicle speed and  
yaw rate.

74. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
15 determining a lateral acceleration and a steering  
velocity.

75. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
20 determining a roll responsive control signal in  
response to a roll rate.

76. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
25 determining a roll responsive control signal in  
response to a vehicle speed.

77. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
30 determining a roll responsive control signal in  
response to a yaw rate a pitch angle.

78. A method as recited in claim 69 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a pitch rate.

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79. A method as recited in claim 69 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a pitch angle.

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80. A method as recited in claim 69 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a global positioning system signal.

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81. A method as recited in claim 69 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a steering angle.

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82. A method as recited in claim 69 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a steering velocity.

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83. A method as recited in claim 69 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a wheel speed.

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84. A method as recited in claim 69 wherein determining a roll responsive control signal comprises

determining a roll responsive control signal in response to a wheel normal load estimate.

85. A method as recited in claim 69 wherein  
5 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a road bank angle.

86. A method as recited in claim 69 wherein  
10 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a roll acceleration.

87. A method as recited in claim 69 wherein  
15 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a longitudinal acceleration.

88. A method as recited in claim 69 wherein  
20 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a roll angle.

89. A method as recited in claim 69 wherein  
25 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a reference roll angle.

90. A method as recited in claim 69 wherein  
30 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a relative roll angle.

91. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
5 response to a road bank angle and a previous roll angle  
estimate.

92. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
10 determining a roll responsive control signal in  
response to a road bank angle and a reference roll  
angle.

93. A method as recited in claim 69 wherein  
15 determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
response to a body roll angle initialization.

94. A method as recited in claim 93 wherein the  
20 body roll angle initialization is determined in  
response to a roll angle estimate and a lateral  
acceleration.

95. A method as recited in claim 69 wherein  
25 determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
response to an instantaneous roll angle reference.

96. A method as recited in claim 69 wherein the  
30 roll angle signal reference is determined in response  
to a vehicle speed, a yaw rate and a lateral  
acceleration.

97. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
5 response to a roll angle estimate.

98. A method as recited in claim 69 wherein the  
roll responsive control signal is determined in  
response to a reference roll angle and a body roll  
10 integration.

99. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
15 response to a model roll angle.

100. A method as recited in claim 99 wherein the  
model roll responsive control signal is determined in  
response to a chassis roll observer.

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101. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
response to a road bank angle time constant.

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102. A method as recited in claim 101 wherein the  
road bank angle time constant is determined in response  
to a steering velocity, a lateral acceleration and a  
vehicle speed.

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103. A method as recited in claim 69 wherein  
determining a roll responsive control signal comprises

determining a roll responsive control signal in response to body slip.

104. A method of controlling roll stability of a  
5 vehicle comprising the steps of:

determining a vehicle roll condition; and

generating a tire moment in response to the vehicle roll condition so that a net moment on the vehicle is counter to a roll direction.

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105. A method as recited in claim 104 wherein the tire moment approaches a gravity moment.

106. A method as recited in claim 104 wherein  
15 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a lateral acceleration.

107. A method as recited in claim 104 wherein  
20 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a lateral acceleration and a yaw rate.

108. A method as recited in claim 104 wherein  
25 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a lateral acceleration, a yaw rate and a vehicle speed.

109. A method as recited in claim 104 wherein  
30 determining a vehicle roll condition comprises determining a lateral acceleration and a steering velocity.



110. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
5 roll rate.

111. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
10 vehicle speed.

112. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
15 yaw rate a pitch angle.

113. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
20 pitch rate.

114. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
25 pitch angle.

115. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
30 global positioning system signal.

116. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a steering angle.

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117. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a steering velocity.

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118. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a wheel speed.

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119. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a wheel normal load estimate.

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120. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle.

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121. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll acceleration.

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122. A method as recited in claim 104 wherein determining a vehicle roll condition comprises

determining a vehicle roll condition in response to a longitudinal acceleration.

123. A method as recited in claim 104 wherein  
5 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll angle.

124. A method as recited in claim 104 wherein  
10 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a reference roll angle.

125. A method as recited in claim 104 wherein  
15 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a relative roll angle.

126. A method as recited in claim 104 wherein  
20 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle and a previous roll angle estimate.

127. A method as recited in claim 104 wherein  
25 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle and a reference roll angle.

128. A method as recited in claim 104 wherein  
30 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a body roll angle initialization.

129. A method as recited in claim 128 wherein the  
body roll angle initialization is determined in  
response to a roll angle estimate and a lateral  
5 acceleration.

130. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to an  
10 instantaneous roll angle reference.

131. A method as recited in claim 130 wherein the  
instantaneous roll angle reference is determined in  
response to a vehicle speed, a yaw rate and a lateral  
15 acceleration.

132. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
20 roll angle estimate.

133. A method as recited in claim 132 wherein the  
roll angle estimate is determined in response to a  
reference roll angle and a body roll integration.  
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134. A method as recited in claim 104 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
model roll angle.  
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135. A method as recited in claim 134 wherein the model roll angle is determined in response to a chassis roll observer.

5        136. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle time constant.

10       137. A method as recited in claim 136 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

15       138. A method as recited in claim 104 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to body slip.

20       139. A method of controlling roll stability of a vehicle comprising the steps of:  
         determining a roll angle of the vehicle; and  
         applying a brake pressure distribution in response  
to the roll angle to prevent the vehicle from rolling  
25 over.

         140. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a lateral acceleration.

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141. A method as recited in claim 139 determining a roll angle comprises determining a roll angle in response to a lateral acceleration and a yaw rate.

5        142. A method as recited in claim 139 determining a roll angle comprises determining a roll angle in response to a lateral acceleration, vehicle speed and a yaw rate.

10       143. A method as recited in claim 139 wherein determining a roll angle comprises determining a lateral acceleration and a steering velocity.

15       144. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a roll rate.

20       145. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a vehicle speed.

25       146. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a yaw rate a pitch angle.

147. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a pitch rate.

30       148. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a pitch angle.

149. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a global positioning system  
5 signal.

150. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a steering angle.  
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151. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a steering velocity.

152. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a wheel speed.  
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153. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a wheel normal load estimate.  
20

154. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a road bank angle.  
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155. A method as recited in claim 139 wherein  
determining a roll angle comprises determining a roll  
angle in response to a roll acceleration.  
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156. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a longitudinal acceleration.

5        157. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a roll angle.

10       158. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a reference roll angle.

15       159. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a relative roll angle.

20       160. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle and a previous roll angle estimate.

25       161. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle and a reference roll angle.

30       162. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a body roll angle initialization.

163. A method as recited in claim 162 wherein the body roll angle initialization is determined in



response to a roll angle estimate and a lateral acceleration.

164. A method as recited in claim 139 wherein  
5 determining a roll angle comprises determining a roll angle in response to an instantaneous roll angle reference.

165. A method as recited in claim 164 wherein the  
10 instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

166. A method as recited in claim 139 wherein  
15 determining a roll angle comprises determining a roll angle in response to a roll angle estimate.

167. A method as recited in claim 166 wherein the  
20 roll angle estimate is determined in response to a reference roll angle and a body roll integration.

168. A method as recited in claim 139 wherein  
25 determining a roll angle comprises determining a roll angle in response to a model roll angle.

169. A method as recited in claim 168 wherein the  
model roll angle is determined in response to a chassis roll observer.

30 170. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle time constant.

171. A method as recited in claim 170 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

172. A method as recited in claim 139 wherein determining a roll angle comprises determining a roll angle in response to body slip.

173. A method of controlling roll stability of a vehicle having a front brake and a rear brake comprising:

determining a roll condition of the vehicle; and  
determining a brake pressure distribution between the front brake and the rear brake in response to the roll condition.

174. A method as recited in claim 173 wherein determining a brake pressure distribution comprises determining a right side brake force distribution by determining an amount of front right brake force and rear right brake force.

175. A method as recited in claim 173 wherein determining a brake pressure distribution comprises determining a left side brake force distribution by determining an amount of front left brake force and rear left brake force.

176. A method as recited in claim 173 wherein determining a roll condition comprises determining a lateral acceleration.

5        177. A method as recited in claim 173 wherein determining a roll condition comprises determining a lateral acceleration and a yaw rate.

10       178. A method as recited in claim 173 wherein determining a roll condition comprises determining a lateral acceleration, a vehicle speed and a yaw rate.

15       179. A method as recited in claim 173 wherein determining a roll condition comprises determining a lateral acceleration and a steering velocity.

20       180. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a roll rate.

20       181. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a vehicle speed.

25       182. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a yaw rate a pitch angle.

30       183. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a pitch rate.

184. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a pitch angle.

5        185. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a global positioning system signal.

10       186. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a steering angle.

15       187. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a steering velocity.

20       188. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a wheel speed.

25       189. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a wheel normal load estimate.

30       190. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle.

191. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a roll acceleration.

5        192. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a longitudinal acceleration.

10       193. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a roll angle.

15       194. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a reference roll angle.

20       195. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a relative roll angle.

25       196. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a previous roll angle estimate.

30       197. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a reference roll angle.

198. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a body roll angle initialization.

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199. A method as recited in claim 198 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

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200. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to an instantaneous roll angle reference.

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201. A method as recited in claim 200 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

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202. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a roll angle estimate.

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203. A method as recited in claim 202 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

30

204. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a roll angle estimate.

205. A method as recited in claim 204 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

5        206. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a model roll angle.

10       207. A method as recited in claim 206 wherein the model roll angle is determined in response to a chassis roll observer.

15       208. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle time constant.

20       209. A method as recited in claim 208 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

25       210. A method as recited in claim 173 wherein determining a roll condition comprises determining a roll condition in response to body slip.

211. A method of controlling roll stability of a vehicle comprising the steps of:

30       determining a roll angle estimate; and  
applying a brake pressure distribution in response to the roll angle estimate to prevent the vehicle from rolling over.

212. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a lateral acceleration.

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213. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a lateral acceleration and a yaw rate.

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214. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a lateral acceleration, a vehicle speed and a yaw rate.

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215. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a lateral acceleration and a steering velocity.

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216. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a roll rate.

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217. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a vehicle speed.

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218. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a yaw rate a pitch angle.



219. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a pitch rate.

5        220. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a pitch angle.

10       221. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a global positioning system signal.

15       222. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a steering angle.

20       223. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a steering velocity.

25       224. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a wheel speed.

30       225. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a wheel normal load estimate.

226. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle.

5        227. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a roll acceleration.

10       228. A method as recited in claim 211 determining a roll angle estimate comprises determining a roll angle estimate in response to a longitudinal acceleration.

15       229. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a reference roll angle.

20       230. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a relative roll angle.

25       231. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle and a previous roll angle estimate.

30       232. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle and a reference roll angle.

233. A method as recited in claim 211 wherein  
determining a roll angle estimate comprises determining  
a roll angle estimate in response to a body roll angle  
5 initialization.

234. A method as recited in claim 233 wherein the  
body roll angle initialization is determined in  
response to a lateral acceleration.  
10

235. A method as recited in claim 211 wherein  
determining a roll angle estimate comprises determining  
a roll angle estimate in response to an instantaneous  
roll angle reference.  
15

236. A method as recited in claim 235 wherein the  
instantaneous roll angle reference is determined in  
response to a vehicle speed, a yaw rate and a lateral  
acceleration.  
20

237. A method as recited in claim 211 wherein the  
roll angle estimate is determined in response to a  
reference roll angle and a body roll integration.

238. A method as recited in claim 211 wherein  
determining a roll angle estimate comprises determining  
a roll angle in response to a model roll angle.  
25

239. A method as recited in claim 238 wherein the  
30 model roll angle is determined in response to a chassis  
roll observer.

240. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle time constant.

5

241. A method as recited in claim 240 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

10

242. A method as recited in claim 211 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to body slip.

15

243. A method of controlling roll stability of a vehicle comprising the steps of:

determining a roll responsive control signal; and  
applying a brake pressure distribution in response to the roll responsive control signal to prevent the vehicle from rolling over.

20

244. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a lateral acceleration.

25

245. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a lateral acceleration and a yaw rate.

30

246. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
response to a lateral acceleration, a vehicle speed and  
5 a yaw rate.

247. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
determining a lateral acceleration and a steering  
10 velocity.

248. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
15 response to a lateral acceleration, a vehicle speed and  
a yaw rate.

249. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
20 determining a roll responsive control signal in  
response to a roll rate.

250. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
25 determining a roll responsive control signal in  
response to a vehicle speed.

251. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
30 determining a roll responsive control signal in  
response to a yaw rate a pitch angle.

252. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a pitch rate.

5

253. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a pitch angle.

10

254. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a global positioning system signal.

15

255. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a steering angle.

20

256. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a steering velocity.

25

257. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a wheel speed.

30

258. A method as recited in claim 243 wherein determining a roll responsive control signal comprises

determining a roll responsive control signal in response to a wheel normal load estimate.

259. A method as recited in claim 243 wherein  
5 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a road bank angle.

260. A method as recited in claim 243 wherein  
10 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a roll acceleration.

261. A method as recited in claim 243 wherein  
15 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a longitudinal acceleration.

262. A method as recited in claim 243 wherein  
20 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a roll angle.

263. A method as recited in claim 243 wherein  
25 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a reference roll angle.

264. A method as recited in claim 243 wherein  
30 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a relative roll angle.

265. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
5 response to a road bank angle and a previous roll angle  
estimate.

266. A method as recited in claim 243 wherein  
determining a roll responsive control signal comprises  
10 determining a roll responsive control signal in  
response to a road bank angle and a reference roll  
angle.

267. A method as recited in claim 243 wherein  
15 determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
response to a body roll angle initialization.

268. A method as recited in claim 267 wherein the  
20 body roll angle initialization is determined in  
response to a roll angle estimate and a lateral  
acceleration.

269. A method as recited in claim 243 wherein  
25 determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
response to an instantaneous roll angle reference.

270. A method as recited in claim 269 wherein the  
30 instantaneous roll angle reference is determined in  
response to a vehicle speed, a yaw rate and a lateral  
acceleration.



271. A method as recited in claim 243 wherein the roll responsive control signal is determined in response to a reference roll angle and a body roll  
5 integration.

272. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in  
10 response to a roll angle estimate.

273. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in  
15 response to a model roll angle.

274. A method as recited in claim 273 wherein the model roll responsive control signal is determined in response to a chassis roll observer.  
20

275. A method as recited in claim 243 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a road bank angle time constant.  
25

276. A method as recited in claim 275 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.  
30

277. A method as recited in claim 243 wherein the roll responsive control signal is determined in response to body slip.

5        278. A method of controlling roll stability of a vehicle comprising the steps of:  
determining a vehicle roll condition; and  
applying a brake pressure distribution in response to the vehicle roll condition to prevent the vehicle  
10 from rolling over.

279. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a  
15 lateral acceleration.

280. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a  
20 lateral acceleration and a yaw rate.

281. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a  
25 lateral acceleration, a vehicle speed and a yaw rate.

282. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a lateral acceleration and a steering  
30 velocity.

283. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll rate.

5

284. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a vehicle speed.

10

285. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a yaw rate a pitch angle.

15

286. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a pitch rate.

20

287. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a pitch angle.

25

288. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a global positioning system signal.

30

289. A method as recited in claim 278 wherein determining a vehicle roll condition comprises

determining a vehicle roll condition in response to a steering angle.

290. A method as recited in claim 278 wherein  
5 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a steering velocity.

291. A method as recited in claim 278 wherein  
10 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a wheel speed.

292. A method as recited in claim 278 wherein  
15 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a wheel normal load estimate.

293. A method as recited in claim 278 wherein  
20 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle.

294. A method as recited in claim 278 wherein  
25 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll acceleration.

295. A method as recited in claim 278 wherein  
30 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a longitudinal acceleration.

296. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
5 roll angle.

297. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
10 reference roll angle.

298. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
15 relative roll angle.

299. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
20 road bank angle and a previous roll angle estimate.

300. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
25 road bank angle and a reference roll angle.

301. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
30 body roll angle initialization.

302. A method as recited in claim 301 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

5

303. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to an instantaneous roll angle reference.

10

304. A method as recited in claim 303 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

15

305. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll angle estimate.

20

306. A method as recited in claim 305 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

25

307. A method as recited in claim 278 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a model roll angle.

30

308. A method as recited in claim 307 wherein the model roll angle is determined in response to a chassis roll observer.

309. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
5 road bank angle time constant.

310. A method as recited in claim 309 wherein the  
road bank angle time constant is determined in response  
to a steering velocity, a lateral acceleration and a  
10 vehicle speed.

311. A method as recited in claim 278 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to  
15 body slip.

312. A method of controlling roll stability of a  
vehicle comprising the steps of:  
determining a roll angle of the vehicle; and  
20 reducing a tire force vector in response to roll  
angle to prevent the vehicle from rolling over.

313. A method as recited in claim 312 wherein  
determining a roll angle comprises determining a roll  
25 angle in response to a lateral acceleration.

314. A method as recited in claim 312 determining  
a roll angle comprises determining a roll angle in  
response to a lateral acceleration and yaw rate.

30

315. A method as recited in claim 312 determining  
a roll angle comprises determining a roll angle in

response to a lateral acceleration, yaw rate vehicle speed.

316. A method as recited in claim 312 wherein  
5 determining a roll angle comprises determining a lateral acceleration and a steering velocity.

317. A method as recited in claim 312 wherein  
10 determining a roll angle comprises determining a roll angle in response to a roll rate.

318. A method as recited in claim 312 wherein  
15 determining a roll angle comprises determining a roll angle in response to a vehicle speed.

319. A method as recited in claim 312 wherein  
determining a roll angle comprises determining a roll angle in response to a yaw rate a pitch angle.

20 320. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a pitch rate.

321. A method as recited in claim 312 wherein  
25 determining a roll angle comprises determining a roll angle in response to a pitch angle.

322. A method as recited in claim 312 wherein  
30 determining a roll angle comprises determining a roll angle in response to a global positioning system signal.



323. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a steering angle.

5        324. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a steering velocity.

10       325. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a wheel speed.

15       326. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a wheel normal load estimate.

20       327. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle.

328. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a roll acceleration.

25       329. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a longitudinal acceleration.

30       330. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a reference roll angle.

331. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a relative roll angle.

5        332. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle and a previous roll angle estimate.

10       333. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle and a reference roll angle.

15       334. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a body roll angle initialization.

20       335. A method as recited in claim 334 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

25       336. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to an instantaneous roll angle reference.

30       337. A method as recited in claim 336 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

338. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a roll angle estimate.

5

339. A method as recited in claim 338 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

10

340. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a model roll angle.

15

341. A method as recited in claim 340 wherein the model roll angle is determined in response to a chassis roll observer.

20

342. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to a road bank angle time constant.

25

343. A method as recited in claim 342 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

30

344. A method as recited in claim 312 wherein determining a roll angle comprises determining a roll angle in response to body slip.

345. A method of controlling roll stability of a vehicle comprising the steps of:

determining a roll angle estimate; and  
reducing a tire force vector in response to roll  
angle estimate to prevent the vehicle from rolling  
over.

5

346. A method as recited in claim 345 determining  
a roll angle comprises determining a roll angle  
estimate in response to a lateral acceleration.

10

347. A method as recited in claim 345 determining  
a roll angle estimate comprises determining a roll  
angle estimate in response to a lateral acceleration  
and a yaw rate.

15

348. A method as recited in claim 345 determining  
a roll angle estimate comprises determining a roll  
angle estimate in response to a lateral acceleration, a  
vehicle speed and a yaw rate.

20

349. A method as recited in claim 345 wherein  
determining a roll angle estimate comprises determining  
a lateral acceleration and a steering velocity.

25

350. A method as recited in claim 345 determining  
a roll angle estimate comprises determining a roll  
angle estimate in response to a roll rate.

30

351. A method as recited in claim 345 determining  
a roll angle estimate comprises determining a roll  
angle estimate in response to a vehicle speed.

352. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a yaw rate a pitch angle.

5        353. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a pitch rate.

10       354. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a pitch angle.

15       355. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a global positioning system signal.

20       356. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a steering angle.

25       357. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a steering velocity.

358. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll angle estimate in response to a wheel speed.

30       359. A method as recited in claim 345 determining a roll angle estimate comprises determining a roll

angle estimate in response to a wheel normal load estimate.

360. A method as recited in claim 345 determining  
5 a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle.

361. A method as recited in claim 345 determining  
a roll angle estimate comprises determining a roll  
10 angle estimate in response to a roll acceleration.

362. A method as recited in claim 345 determining  
a roll angle estimate comprises determining a roll  
angle estimate in response to a longitudinal  
15 acceleration.

363. A method as recited in claim 345 wherein  
determining a roll angle estimate comprises determining  
a roll angle estimate in response to a reference roll  
20 angle.

364. A method as recited in claim 345 wherein  
determining a roll angle estimate comprises determining  
a roll angle estimate in response to a relative roll  
25 angle.

365. A method as recited in claim 345 wherein  
determining a roll angle estimate comprises determining  
a roll angle estimate in response to a road bank angle  
30 and a previous roll angle estimate.

366. A method as recited in claim 345 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle and a reference roll angle.

5

367. A method as recited in claim 345 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a body roll angle initialization.

10

368. A method as recited in claim 345 wherein the body roll angle initialization is determined in response to a lateral acceleration.

15

369. A method as recited in claim 345 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to an instantaneous roll angle reference.

20

370. A method as recited in claim 369 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

25

371. A method as recited in claim 345 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

30

372. A method as recited in claim 345 wherein determining a roll angle comprises determining a roll angle in response to a model roll angle.

373. A method as recited in claim 372 wherein the model roll angle is determined in response to a chassis roll observer.

5        374. A method as recited in claim 345 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to a road bank angle time constant.

10       375. A method as recited in claim 374 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

15       376. A method as recited in claim 345 wherein determining a roll angle estimate comprises determining a roll angle estimate in response to body slip.

20       377. A method of controlling roll stability of a vehicle comprising the steps of:

         determining a roll responsive control signal;  
         reducing a tire force vector in response to roll angle to prevent the vehicle from rolling over.

25       378. A method as recited in claim 377 wherein determining a roll angle comprises determining a roll responsive control signal in response to a lateral acceleration.

30       379. A method as recited in claim 377 wherein determining a roll responsive control signal comprises



determining a roll responsive control signal in response to a lateral acceleration and a yaw rate.

5        380. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a lateral acceleration, a vehicle speed and a yaw rate.

10       381. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a roll rate.

15       382. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a vehicle speed.

20       383. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a yaw rate a pitch angle.

25       384. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a pitch rate.

30       385. A method as recited in claim 377 wherein determining a roll responsive control signal comprises

determining a roll responsive control signal in response to a pitch angle.

386. A method as recited in claim 377 wherein  
5 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a global positioning system signal.

387. A method as recited in claim 377 wherein  
10 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a steering angle.

388. A method as recited in claim 377 wherein  
15 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a steering velocity.

389. A method as recited in claim 377 wherein  
20 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a wheel speed.

390. A method as recited in claim 377 wherein  
25 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a wheel normal load estimate.

391. A method as recited in claim 377 wherein  
30 determining a roll responsive control signal comprises determining a roll responsive control signal in response to a road bank angle.

392. A method as recited in claim 377 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
5 response to a roll acceleration.

393. A method as recited in claim 377 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
10 response to a longitudinal acceleration.

394. A method as recited in claim 377 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
15 response to a roll angle.

395. A method as recited in claim 377 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
20 response to a reference roll angle.

396. A method as recited in claim 377 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
25 response to a relative roll angle.

397. A method as recited in claim 377 wherein  
determining a roll responsive control signal comprises  
determining a roll responsive control signal in  
30 response to a road bank angle and a previous roll angle  
estimate.

398. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a road bank angle and a reference roll angle.  
5

399. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a body roll angle initialization.  
10

400. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a model roll angle.  
15

401. A method as recited in claim 400 wherein the model roll responsive control signal is determined in response to a chassis roll observer.  
20

402. A method as recited in claim 377 wherein determining a roll responsive control signal comprises determining a roll responsive control signal in response to a road bank angle time constant.  
25

403. A method as recited in claim 402 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.  
30

404. A method as recited in claim 377 wherein determining a roll responsive control signal comprises

determining a roll responsive control signal in response to body slip.

405. A method of controlling roll stability of a vehicle comprising the steps of:

determining a vehicle roll condition; and

reducing a tire force vector in response to the vehicle roll condition to prevent the vehicle from rolling over.

10

406. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a lateral acceleration.

15

407. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a lateral acceleration and a yaw rate.

20

408. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a lateral acceleration, a vehicle speed and a yaw rate.

25

409. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a lateral acceleration and a steering velocity.

30

410. A method as recited in claim 405 wherein determining a vehicle roll condition comprises

determining a vehicle roll condition in response to a roll rate.

411. A method as recited in claim 405 wherein  
5 determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a vehicle speed.

412. A method as recited in claim 405 wherein  
10 determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a yaw rate a pitch angle.

413. A method as recited in claim 405 wherein  
15 determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a pitch rate.

414. A method as recited in claim 405 wherein  
20 determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a pitch angle.

415. A method as recited in claim 405 wherein  
25 determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a global positioning system signal.

416. A method as recited in claim 405 wherein  
30 determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a steering angle.

417. A method as recited in claim 405 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
5 steering velocity.

418. A method as recited in claim 405 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
10 wheel speed.

419. A method as recited in claim 405 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
15 wheel normal load estimate.

420. A method as recited in claim 405 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
20 road bank angle.

421. A method as recited in claim 405 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
25 roll acceleration.

422. A method as recited in claim 405 wherein  
determining a vehicle roll condition comprises  
determining a vehicle roll condition in response to a  
30 longitudinal acceleration.

423. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll angle.

5

424. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a reference roll angle.

10

425. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a relative roll angle.

15

426. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle and a previous roll angle estimate.

20

427. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle and a reference roll angle.

25

428. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a body roll angle initialization.

30

429. A method as recited in claim 428 wherein the body roll angle initialization is determined in



response to a roll angle estimate and a lateral acceleration.

430. A method as recited in claim 405 wherein  
5 determining a vehicle roll condition comprises determining a vehicle roll condition in response to an instantaneous roll angle reference.

431. A method as recited in claim 430 wherein the  
10 instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

432. A method as recited in claim 405 wherein  
15 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a roll angle estimate.

433. A method as recited in claim 405 wherein the  
20 roll angle estimate is determined in response to a reference roll angle and a body roll integration.

434. A method as recited in claim 405 wherein  
25 determining a vehicle roll condition comprises determining a vehicle roll condition in response to a model roll angle.

435. A method as recited in claim 434 wherein the  
30 model roll angle is determined in response to a chassis roll observer.

436. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to a road bank angle time constant.

5

437. A method as recited in claim 436 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

10

438. A method as recited in claim 405 wherein determining a vehicle roll condition comprises determining a vehicle roll condition in response to body slip.

15

439. A rollover control system for an automotive vehicle having a steering system and a brake system comprising:

20 a roll condition sensor producing a rollover signal in response to an impending rollover; and

a controller apportioning an amount of correction provided by the steering system and the and brake system to prevent the vehicle from rolling over.

25

440. A system as recited in claim 439 wherein the roll condition sensor comprises a lateral acceleration sensor.

30

441. A system as recited in claim 439 wherein the roll condition sensor comprises a lateral acceleration sensor and a yaw rate sensor.

442. A system as recited in claim 439 wherein the roll condition sensor comprises a lateral acceleration sensor, a yaw rate sensor and a vehicle speed sensor.

5        443. A system as recited in claim 439 wherein the roll condition sensor comprises a lateral acceleration sensor and steering velocity sensor.

10       444. A system as recited in claim 439 wherein the roll condition sensor comprises a roll rate sensor.

445. A system as recited in claim 439 wherein the roll condition sensor comprises a vehicle speed sensor.

15       446. A system as recited in claim 439 wherein the roll condition sensor comprises a yaw rate sensor and a pitch angle sensor.

20       447. A system as recited in claim 439 wherein the roll condition sensor comprises a pitch rate sensor.

448. A system as recited in claim 439 wherein the roll condition sensor comprises a pitch angle sensor.

25       449. A system as recited in claim 439 wherein the roll condition sensor comprises a global positioning system.

30       450. A system as recited in claim 439 wherein the roll condition sensor comprises a steering angle sensor.

451. A system as recited in claim 439 wherein the roll condition sensor comprises a steering velocity sensor.

5        452. A system as recited in claim 439 wherein the roll condition sensor comprises a wheel speed sensor.

10       453. A system as recited in claim 439 wherein the roll condition sensor comprises wheel normal load sensor.

15       454. A system as recited in claim 439 wherein the roll condition sensor comprises a roll acceleration sensor.

20       455. A system as recited in claim 439 wherein the roll condition sensor comprises a longitudinal acceleration.

25       456. A system as recited in claim 439 wherein the roll condition sensor comprises a roll angle.

30       457. A system as recited in claim 439 wherein the roll condition sensor comprises a vehicle speed sensor, a yaw rate sensor and a lateral acceleration sensor.

35       458. A system as recited in claim 439 wherein the roll condition sensor comprises a chassis roll observer.

40       459. A system as recited in claim 439 wherein the roll condition sensor comprises a suspension sensor.

460. A system as recited in claim 439 wherein the roll condition sensor comprises a body slip sensor.

5        461. A system as recited in claim 439 wherein the roll condition sensor comprises a bank angle sensor.

462. A method of controlling roll stability of a vehicle having a brake system and a steering system  
10 comprising:

      determining a roll condition of the vehicle in response to an impending rollover; and

      apportioning an amount of correction provided by the steering system and the brake system to prevent the  
15 vehicle from rolling over.

463. A method as recited in claim 462 wherein determining a roll condition comprises determining a lateral acceleration.  
20

464. A method as recited in claim 462 wherein determining a roll condition comprises determining a lateral acceleration and a yaw rate.

25        465. A method as recited in claim 462 wherein determining a roll condition comprises determining a lateral acceleration, a vehicle speed and a yaw rate.

466. A method as recited in claim 462 wherein  
30 determining a roll condition comprises determining a lateral acceleration and a steering velocity.

467. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a roll rate.

5        468. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a vehicle speed.

10       469. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a yaw rate a pitch angle.

15       470. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a pitch rate.

20       471. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a pitch angle.

25       472. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a global positioning system signal.

30       473. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a steering angle.

30       474. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a steering velocity.

475. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a wheel speed.

5

476. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a wheel normal load estimate.

10

477. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle.

15

478. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a roll acceleration.

479. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a longitudinal acceleration.

480. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a roll angle.

481. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a reference roll angle.

30

482. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a relative roll angle.

5        483. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a previous roll angle estimate.

10       484. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a reference roll angle.

15       485. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to a body roll angle initialization.

20       486. A method as recited in claim 485 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

25       487. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to an instantaneous roll angle reference.

30       488. A method as recited in claim 487 wherein the instantaneous roll angle reference is determined in



response to a vehicle speed, a yaw rate and a lateral acceleration.

489. A method as recited in claim 462 wherein  
5 determining a roll condition comprises determining a  
roll condition in response to a roll angle estimate.

490. A method as recited in claim 489 wherein the  
roll angle estimate is determined in response to a  
10 reference roll angle and a body roll integration.

491. A method as recited in claim 462 wherein  
determining a roll condition comprises determining a  
roll condition in response to a roll angle estimate.  
15

492. A method as recited in claim 491 wherein the  
roll angle estimate is determined in response to a  
reference roll angle and a body roll integration.

20 493. A method as recited in claim 462 wherein  
determining a roll condition comprises determining a  
roll condition in response to a model roll angle.

494. A method as recited in claim 493 wherein the  
25 model roll angle is determined in response to a chassis  
roll observer.

495. A method as recited in claim 462 wherein  
determining a roll condition comprises determining a  
30 roll condition in response to a road bank angle time  
constant.

496. A method as recited in claim 495 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

5

497. A method as recited in claim 462 wherein determining a roll condition comprises determining a roll condition in response to body slip.

10 498. A rollover control system for an automotive vehicle having a front brake and a rear brake comprising:

a roll condition sensor producing a roll condition signal in response to an impending rollover; and

15 a controller proportioning brake pressures between a front brake and rear brake in response to the roll condition signal to prevent the vehicle from rolling over.

20 499. A system as recited in claim 498 wherein the roll condition sensor comprises a lateral acceleration sensor.

25 500. A system as recited in claim 498 wherein the roll condition sensor comprises a lateral acceleration sensor and a yaw rate sensor.

30 501. A system as recited in claim 498 wherein the roll condition sensor comprises a lateral acceleration sensor and steering velocity sensor.

502. A system as recited in claim 498 wherein the roll condition sensor comprises a roll rate sensor.

503. A system as recited in claim 498 wherein the  
5 roll condition sensor comprises a vehicle speed sensor.

504. A system as recited in claim 498 wherein the roll condition sensor comprises a yaw rate sensor and a pitch angle sensor.

10

505. A system as recited in claim 498 wherein the roll condition sensor comprises a pitch rate sensor.

506. A system as recited in claim 498 wherein the  
15 roll condition sensor comprises a pitch angle sensor.

507. A system as recited in claim 498 wherein the roll condition sensor comprises a global positioning system.

20

508. A system as recited in claim 498 wherein the roll condition sensor comprises a steering angle sensor.

25 509. A system as recited in claim 498 wherein the roll condition sensor comprises a steering velocity sensor.

510. A system as recited in claim 498 wherein the  
30 roll condition sensor comprises a wheel speed sensor.

511. A system as recited in claim 498 wherein the roll condition sensor comprises wheel normal load sensor.

5        512. A system as recited in claim 498 wherein the roll condition sensor comprises a roll acceleration sensor.

10       513. A system as recited in claim 498 wherein the roll condition sensor comprises a longitudinal acceleration.

15       514. A system as recited in claim 498 wherein the roll condition sensor comprises a roll angle.

515. A system as recited in claim 498 wherein the roll condition sensor comprises a vehicle speed sensor, a yaw rate sensor and a lateral acceleration sensor.

20       516. A system as recited in claim 498 wherein the roll condition sensor comprises a chassis roll observer.

25       517. A system as recited in claim 498 wherein the roll condition sensor comprises a suspension sensor.

518. A system as recited in claim 498 wherein the roll condition sensor comprises a body slip sensor.

30       519. A system as recited in claim 498 wherein the roll condition sensor comprises a bank angle sensor.

520. A method of controlling a rollover control system for an automotive vehicle having a front brake and a rear brake comprising:

5 determining a roll condition signal in response to an impending rollover; and

proportioning brake pressures between a front brake and a rear brake in response to the roll condition signal to prevent the vehicle from rolling over.

10

521. A method as recited in claim 520 wherein determining a roll condition comprises determining a lateral acceleration.

15

522. A method as recited in claim 520 wherein determining a roll condition comprises determining a lateral acceleration and a yaw rate.

20

523. A method as recited in claim 520 wherein determining a roll condition comprises determining a lateral acceleration, a vehicle speed and a yaw rate.

25

524. A method as recited in claim 520 wherein determining a roll condition comprises determining a lateral acceleration and a steering velocity.

30

525. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a roll rate.

526. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a vehicle speed.

5        527. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a yaw rate a pitch angle.

10       528. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a pitch rate.

15       529. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a pitch angle.

20       530. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a global positioning system signal.

25       531. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a steering angle.

532. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a steering velocity.

30       533. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a wheel speed.

534. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a wheel normal load  
5 estimate.

535. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a road bank angle.  
10

536. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a roll acceleration.

537. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a longitudinal  
acceleration.  
15

538. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a roll angle.  
20

539. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a reference roll angle.  
25

540. A method as recited in claim 520 wherein  
determining a roll condition comprises determining a  
roll condition in response to a relative roll angle.  
30

541. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a previous roll angle estimate.

5

542. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a reference roll angle.

10

543. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a body roll angle initialization.

15

544. A method as recited in claim 543 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

20

545. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to an instantaneous roll angle reference.

25

546. A method as recited in claim 545 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

30



547. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a roll angle estimate.

5        548. A method as recited in claim 547 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

10       549. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a roll angle estimate.

15       550. A method as recited in claim 549 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

20       551. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a model roll angle.

552. A method as recited in claim 551 wherein the model roll angle is determined in response to a chassis roll observer.

25       553. A method as recited in claim 520 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle time constant.

30       554. A method as recited in claim 553 wherein the road bank angle time constant is determined in response

to a steering velocity, a lateral acceleration and a vehicle speed.

555. A method as recited in claim 520 wherein  
5 determining a roll condition comprises determining a roll condition in response to body slip.

556. A rollover control system for an automotive vehicle traveling a path having a front brake and a  
10 rear brake comprising:

a roll condition sensor producing a roll condition signal in response to an impending rollover; and

a controller balancing braking pressures between the front brake and the rear brake in response to the  
15 roll condition signal to minimize induced vehicle yaw or minimize induced path deviation.

557. A system as recited in claim 556 wherein the roll condition sensor comprises a lateral acceleration  
20 sensor.

558. A system as recited in claim 556 wherein the roll condition sensor comprises a lateral acceleration sensor and a yaw rate sensor.  
25

559. A system as recited in claim 556 wherein the roll condition sensor comprises a lateral acceleration sensor, a vehicle speed sensor and a yaw rate sensor.

30 560. A system as recited in claim 556 wherein the roll condition sensor comprises a lateral acceleration sensor and steering velocity sensor.

561. A system as recited in claim 556 wherein the roll condition sensor comprises a roll rate sensor.

5 562. A system as recited in claim 556 wherein the roll condition sensor comprises a vehicle speed sensor.

563. A system as recited in claim 556 wherein the roll condition sensor comprises a yaw rate sensor and a  
10 pitch angle sensor.

564. A system as recited in claim 556 wherein the roll condition sensor comprises a pitch rate sensor.

15 565. A system as recited in claim 556 wherein the roll condition sensor comprises a pitch angle sensor.

566. A system as recited in claim 556 wherein the roll condition sensor comprises a global positioning  
20 system.

567. A system as recited in claim 556 wherein the roll condition sensor comprises a steering angle  
25 sensor.

568. A system as recited in claim 556 wherein the roll condition sensor comprises a steering velocity  
sensor.

30 569. A system as recited in claim 556 wherein the roll condition sensor comprises a wheel speed sensor.

570. A system as recited in claim 556 wherein the roll condition sensor comprises wheel normal load sensor.

5 571. A system as recited in claim 556 wherein the roll condition sensor comprises a roll acceleration sensor.

572. A system as recited in claim 556 wherein the  
10 roll condition sensor comprises a longitudinal acceleration.

573. A system as recited in claim 556 wherein the roll condition sensor comprises a roll angle.

15

574. A system as recited in claim 556 wherein the roll condition sensor comprises a chassis roll observer.

20 575. A system as recited in claim 556 wherein the roll condition sensor comprises a suspension sensor.

576. A system as recited in claim 556 wherein the roll condition sensor comprises a body slip sensor.

25

577. A system as recited in claim 556 wherein the roll condition sensor comprises a bank angle sensor.

578. A method of controlling a rollover control  
30 system for an automotive vehicle traveling a path having a front brake and a rear brake comprising:

determining a roll condition signal in response to an impending rollover; and

balancing braking pressures between the front brake and the rear brake in response to the roll condition signal to minimize induced vehicle yaw or  
5 minimize induced path deviation.

579. A method as recited in claim 578 wherein determining a roll condition comprises determining a  
10 lateral acceleration.

580. A method as recited in claim 578 wherein determining a roll condition comprises determining a lateral acceleration and a yaw rate.  
15

581. A method as recited in claim 578 wherein determining a roll condition comprises determining a lateral acceleration, a vehicle speed and a yaw rate.

20 582. A method as recited in claim 578 wherein determining a roll condition comprises determining a lateral acceleration and a steering velocity.

583. A method as recited in claim 578 wherein  
25 determining a roll condition comprises determining a roll condition in response to a roll rate.

584. A method as recited in claim 578 wherein determining a roll condition comprises determining a  
30 roll condition in response to a vehicle speed.

585. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a yaw rate a pitch angle.

5 586. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a pitch rate.

10 587. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a pitch angle.

15 588. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a global positioning system signal.

20 589. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a steering angle.

25 590. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a steering velocity.

591. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a wheel speed.

30 592. A method as recited in claim 578 wherein determining a roll condition comprises determining a

roll condition in response to a wheel normal load estimate.

5 593. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle.

10 594. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a roll acceleration.

15 595. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a longitudinal acceleration.

20 596. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a roll angle.

597. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a reference roll angle.

25 598. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a relative roll angle.

30 500. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a previous roll angle estimate.

600. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle and a reference roll angle.

601. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a body roll angle initialization.

602. A method as recited in claim 601 wherein the body roll angle initialization is determined in response to a roll angle estimate and a lateral acceleration.

603. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to an instantaneous roll angle reference.

604. A method as recited in claim 603 wherein the instantaneous roll angle reference is determined in response to a vehicle speed, a yaw rate and a lateral acceleration.

605. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a roll angle estimate.

30



606. A method as recited in claim 605 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

5        607. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a roll angle estimate.

10       608. A method as recited in claim 607 wherein the roll angle estimate is determined in response to a reference roll angle and a body roll integration.

15       609. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a model roll angle.

20       610. A method as recited in claim 609 wherein the model roll angle is determined in response to a chassis roll observer.

25       611. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to a road bank angle time constant.

30       612. A method as recited in claim 611 wherein the road bank angle time constant is determined in response to a steering velocity, a lateral acceleration and a vehicle speed.

613. A method as recited in claim 578 wherein determining a roll condition comprises determining a roll condition in response to body slip.

5        614. A rollover control system for an automotive vehicle having a brake system with a brake pedal comprising:

        a dynamic control system generating a dynamic control brake signal;

10        a roll condition sensor producing a roll condition signal in response to an impending rollover;

        a controller proportioning brake pressures in response to the roll condition signal, pressure by a driver on the brake pedal and the dynamic control brake  
15        signal to prevent the vehicle from rolling over.

615. A system as recited in claim 614 wherein the dynamic control system comprises a yaw control system.

20        616. A system as recited in claim 614 wherein said controller proportions a front brake pressure and a rear brake pressure.

        617. A system as recited in claim 614 wherein the  
25        roll condition sensor comprises a lateral acceleration sensor.

        618. A system as recited in claim 614 wherein the  
roll condition sensor comprises a lateral acceleration  
30        sensor and a yaw rate sensor.

619. A system as recited in claim 614 wherein the roll condition sensor comprises a lateral acceleration sensor and steering velocity sensor.

5        620. A system as recited in claim 614 wherein the roll condition sensor comprises a roll rate sensor.

621. A system as recited in claim 614 wherein the roll condition sensor comprises a vehicle speed sensor.

10

622. A system as recited in claim 614 wherein the roll condition sensor comprises a yaw rate sensor and a pitch angle sensor.

15        623. A system as recited in claim 614 wherein the roll condition sensor comprises a pitch rate sensor.

624. A system as recited in claim 614 wherein the roll condition sensor comprises a pitch angle sensor.

20

625. A system as recited in claim 614 wherein the roll condition sensor comprises a global positioning system.

25        626. A system as recited in claim 614 wherein the roll condition sensor comprises a steering angle sensor.

627. A system as recited in claim 614 wherein the roll condition sensor comprises a steering velocity sensor.

30

628. A system as recited in claim 614 wherein the roll condition sensor comprises a wheel speed sensor.

629. A system as recited in claim 614 wherein the  
5 roll condition sensor comprises wheel normal load sensor.

630. A system as recited in claim 614 wherein the  
10 roll condition sensor comprises a roll acceleration sensor.

631. A system as recited in claim 614 wherein the  
roll condition sensor comprises a longitudinal acceleration.

15

632. A system as recited in claim 614 wherein the roll condition sensor comprises a roll angle.

633. A system as recited in claim 614 wherein the  
20 roll condition sensor comprises a vehicle speed sensor, a yaw rate sensor and a lateral acceleration sensor.

634. A system as recited in claim 614 wherein the  
roll condition sensor comprises a chassis roll  
25 observer.

635. A system as recited in claim 614 wherein the roll condition sensor comprises a suspension sensor.

30 636. A system as recited in claim 614 wherein the roll condition sensor comprises a body slip sensor.

637. A system as recited in claim 614 wherein the roll condition sensor comprises a bank angle sensor.